Answer **all** the questions.

1   Arnold has several computing devices around his home. Each device has an operating system installed.

   (a) Arnold has a PC which has a Basic Input Output System (BIOS).

   Describe what is meant by the term 'BIOS'.

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   .... **[2]**

   (b) Arnold has a router. It will receive data packets from other computers on Arnold's network or the internet and then route them on to the next step.

   The scheduling algorithm Arnold's router uses is First Come First Served.

   (i) State the name of **one** other scheduling algorithm.

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   .... **[1]**

   (ii) Explain why First Come First Served is a suitable scheduling algorithm for Arnold's router.

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   .... **[2]**

(c) One role of an operating system is to manage the computer's memory.

Two types of memory management are paging and segmentation.

Describe **one** difference between paging and segmentation.

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.... **[2]**

(d) Different computing devices in Arnold's home use different processor architectures.

One processor architecture is the Harvard architecture.

(i) Describe the Harvard architecture.

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.... **[2]**

(ii) Arnold has a smart washing machine.

Explain why the Harvard architecture is suitable for a device like this.

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.... **[2]**

(e) Another role of an operating system is the Interrupt Service Handler. This allows processes being executed by the CPU to be interrupted.

(i) One example of an interrupt would be removing an external hard disk drive from a computer.

State why this would need to interrupt the current fetch-decode-execute cycle of the CPU.

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.... **[1]**

(ii) Interrupt Service Handlers make use of a stack data structure.

Describe how a stack is used when handling interrupts.

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.... **[2]**

2 Charlie owns a veterinary surgery in her local town. She has purchased a new computer for her business so she can complete her accounts, write letters to her customers and keep a record of her customers' personal and appointment details.

She intends to install application software and utility software.

(a) Charlie will install database application software on her computer.

State **one** additional type of application software Charlie could install and give an example of what she might use it for.

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.... **[2]**

(b) Charlie's computer has firewall utility software already installed.

Explain **two** other pieces of utility software that Charlie should install on her computer.

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2 ....

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[4]

(c)* Charlie will use database management software to store customers' personal and appointment details. Charlie is considering both open source and closed source database software.

Compare the differences between open source software and closed source software and recommend which type of database software Charlie should use.

You should refer to the following in your answer:
  •   Cost
  •   Usability
  •   Extensibility
  •   Security
  •   Support available

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.... **[9]**

3 Modern computer systems use networking in order to share hardware, software and data.

Networking uses protocols such as TCP/IP.

(a) State what is meant by the term 'protocol'.

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.... **[1]**

(b) The protocol TCP/IP uses a 4-layer stack.

(i) Complete the table below to show the 4 layers in the TCP/IP stack.

Application
Link

[2]

(ii) Explain **one** advantage of using layers in the protocol TCP/IP.

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.... **[2]**

Turn over

(c)* Many technologists predict that in the future, shops on the high street will use facial recognition to identify customers before they walk into a shop.

Discuss the possible benefits and drawbacks of technology being used in this way.

You should refer to the following in your answer:
- The benefits and drawbacks to both the customers and businesses
- Moral and ethical issues
- Legal issues

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.... **[9]**

4 (a) State why computer systems store data in binary.

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.... **[1]**

(b) (i) Convert the denary number 97 into an **8**-bit binary number.

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.... **[1]**

(ii) Convert the denary number 171 into a hexadecimal number.

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.... **[1]**

(iii) Convert the denary number –97 into an **8**-bit binary number using two's complement.

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.... **[1]**

(iv) Convert the denary number –17 into an **8**-bit binary number using sign and magnitude.

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.... **[1]**

(c) State **one** advantage of using two's complement instead of sign and magnitude.

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.... **[2]**

(d) Calculate the addition of these two 8-bit (unsigned) binary numbers.

Show your working.

11011011
<u>10001001 +</u>

[2]

5 Elliott has designed a logic circuit. The expression he has created for the logic circuit is:

$Q = (A \land \neg B) \lor (\neg A \land C \land D) \lor (A \land B)$

(a) Complete the Karnaugh Map below to simplify this expression. Show your working.

AB

CD	00	01	11	10
00				
01				
11				
10				

Simplified expression:

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.... **[4]**

(b) Draw a Logic diagram for the following expression:

$$Q = \neg(A \wedge B) \vee (C \wedge \neg D)$$

A •

B •

C •

D •

• Q

[3]

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6 George owns a small book shop. He wants a program to work out the daily sales figures.

He uses a text file called "Sales.txt" shown in **Fig. 1**. Each line represents the sales total for a different day of the week. The program can run at any point during the week and therefore the text file may not have seven lines.

2367.34
1986.92
2251.49
1882.40
2412.83
3411.32
2721.76

Fig. 1

The program needs to read the text file and then calculate:
- The number of days that the program is calculating over
- The total sales over that period
- The average daily sales over that period

At the end of the text file, it should then print the results of these calculations to the screen.

(a) When the values are being read from the Sales.txt file they will be a string data type.

In order for them to be processed they will need to be cast (i.e. converted) to a different data type.

Explain what data type the values in "Sales.txt" should be converted to.

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.... **[2]**

(b) George will use iteration to read through the values in the text file.

Describe how George can use iteration when reading from the text file.

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.... **[2]**

(c) Write a procedure called `salesAnalysis` that will meet the rules of George's program.

You should write your procedure using pseudocode or program code.

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END OF QUESTION PAPER